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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/559,864

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Natacha Haik-Beraud

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AIR LIQUIDE

Intellectual Property

2700 POST OAK BOULEVARD, SUITE 1800

HOUSTON, TX 77056

EXAMINER

NGUYEN, NGOC YEN M

ART UNIT

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1793

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/559,864	Applicant(s) HAIK-BERAUD ET AL.	
	Examiner Ngoc-Yen M. Nguyen	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 13-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 13-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 9, 2010 has been entered.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 17 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicants are requested to point out support in the instant specification, by page and line numbers, for “the first adsorption bed to adsorb at least part of the HCN impurities and/or at least one compound of... and germanium” as required in the instant claim 17. It is noted that in the instant specification, it is disclosed that the “first” adsorption bed is denoted as layers “3” and “4” in Figure 1 (note page 12, lines 23-26) and the “first” adsorption bed may “comprised upstream of an activated carbon

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containing potassium iodide to remove compounds of mercury, arsenic and sulfur, followed by a second bed composed of an activated alumina or an activated carbon impregnated with caustic or with sodium carbonate to remove acids, such as ...HCN, etc." (note page 16, lines 6-15). This "first" adsorption bed as disclosed in the instant specification appears to be the same as the "first adsorption bed" of the instant claim 17, however, the claimed "first adsorption bed" is also required in the instant claim 13 to adsorb at least one metal carbonyl (note step (a)). In the instant specification, the adsorption bed "9" which is used to adsorb the metal carbonyls is called the "second" adsorption bed (note page 12, lines 28-29) and this "second" adsorption bed is grade A alumina (note page 17, lines 6-8). There is no indication in the specification that a same adsorption bed can be used to remove both metal carbonyls (as required in the step (a) of claim 13) and HCN impurities and/or Hg, S, etc. (as required in claim 17).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 16-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 16, it is unclear if "the gas stream" refers to the starting gas stream before step (a) or if the steps listed are sequential steps. It is also unclear if there is a "second adsorption bed" in addition to "the first adsorption bed" (claim 13, step (a)) and "the third adsorption bed" (claim 16, step (d)).

In claim 17, it is unclear if step (a) and step (e) are the same step which can simultaneously remove metal carbonyl and HCN and/or Hg, S, etc.

In claim 18, there is no clear antecedent basis for "said gas stream".

In claim 19, if steps (b) and (f) are distinct, it is unclear if these steps are required to be carried out in any order.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13-15, 18-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eijkhoudt et al (6,165,428) in view of Krueger (4,034,062) and Bancon et al (2003/0126089), optionally further in view of Engelbrecht et al (4,320,100).

Eijkhoudt '428 discloses a process for the removal of metal carbonyl from a gaseous stream such as synthesis gas using an adsorbent (note column 1, lines 4-6). Eijkhoudt '428 teaches that the presence of metal carbonyls in synthesis gas which is used as feedstock for industrial processes catalyzed by catalysts, poses severe problems. The catalysts can be poisoned by the metal carbonyls or their decomposition products and as a consequent perform less (note column 1, lines 6-10).

The synthesis gas contains 50% by volume of CO and 40% of hydrogen (note Table 1).

After the step of removing metal carbonyl, the gas is subjected to a hydrogen sulfide and/or CO₂ removing step (note claim 10), such as a process using cold methanol in a physical washing system to remove CO₂ (note paragraph bridging columns 1-2).

The difference is Eijkhoudt '428 does not disclose the step of contacting the gas stream with a catalyst bed to convert at least part of the oxygen and/or at least one unsaturated hydrocarbon present in the gas stream to one or more catalysis products.

Bancon '989 is applied to teach that synthesis gas may contain other impurities such as light hydrocarbons impurities (such as ethane, ethylene, propylene, etc.), CO₂ and/or NO_x (note paragraphs [0020] and [0030]).

Krueger '062 discloses a process for the purification of a gas stream containing primarily hydrogen and carbon monoxide as well as small quantities of oxygen, acetylene and ethylene as impurities, comprising passing said gas stream at a temperature of 250 to 700°F (121-371°C) through a bed of catalyst consisting essentially of a copper catalyst (note claim 1).

Krueger '062 further teaches that hydrogenation processes for removing oxygen, acetylene and ethylene are well known and no departures from well-known hydrogenation processes are required herein. The pressure is in the range of 100 to 500 psig (6.9 to 34.5 bar) (note column 1, lines 65-67). The space velocity is in the range of 2,000 to 10,000 gas volumes per volume of catalyst per hour, depending on the type of catalyst used (note column 1, line 67 to column 2, line 2). These ranges overlap the claimed ranges. With respect to the encompassing and overlapping ranges

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previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

The step of contacting the synthesis gas with the copper catalyst as disclosed in Krueger '989 would inherently remove any NO_x compounds that may be present in the synthesis gas as disclosed in Bancon '989.

Optionally, Engelbrecht '100 can be applied to teach that it is conventional in the art to remove nitrogen oxide and oxygen from a synthesis gas by passing the gas over a hydrogenation catalyst at a temperature of from 120 to 250°C and at a pressure of from 0.5 to 250 bar (note claim 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to remove any light hydrocarbon contained in the synthesis gas of Eijkhoudt '428, as suggested by Bancon '989, by contacting the synthesis gas with a copper catalyst as suggested by Krueger '989 to remove all or substantially hydrocarbon impurities such as ethylene.

Bancon '989 can be further applied to teach that If the amount of CO₂ contained in the stream of syngas to be purified is greater than several thousands of ppm, it is firstly washed with amines (MEA or MDEA type) to remove most of the CO₂. The gas is then sent to a column of adsorbent(s) to remove the residual traces of CO₂ (a few tens of ppm) not removed by the washing with amines and possibly the other impurity or impurities present in the syngas, for example water that is often present at the same time as CO₂ (after washing with the amines, the gas is saturated with water) (note paragraph [0007]).

Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eijkhoudt '428 in view of Bancon '989 and Krueger '062, optionally further in view of Engelbrecht '100 as applied to claims 13-15, 18-24 above, and further in view of Koveal et al (5,948,378) and Britton et al (4,175,928).

The difference not yet discussed is Eijkhoudt '428 does not disclose the step of removing organosulfur, organochlorine, organonitrogen compounds or the step of removing HCN or a metal from the synthesis gas.

Britton '928 discloses that it is known in the art to remove sulfur compounds, organic sulfur compounds from synthesis gas by first converting them to hydrogen sulfide in a catalytic hydrogenation reactor and the hydrogen sulfide is then adsorbed from the synthesis gas stream by passing it through a suitable sorbent (note column 1, lines 64-68).

Koveal '378 discloses a process for removing ammonia and hydrogen cyanide from a synthesis that includes a step of passing the synthesis gas through a bed of absorbent or adsorbent effective for removal of ammonia and hydrogen cyanide, such as activated carbon or alumina (note column 2, lines 21-24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further purify the synthesis gas of Eijkhoudt '428 to remove other common impurities such as organic sulfur compounds, hydrogen cyanide by using known and conventional methods as suggested by Britton '928 and Koveal '378.

Applicant's arguments filed February 9, 2010 have been fully considered but they are not persuasive.

Applicants argue that the skilled artisan would recognize that zeolite has an affinity for hydrocarbons.

In Eijkhoudt '428, the adsorbent is hydrophobic; however, the zeolite in US Pat '170 as referred to by Applicants to support the above argument is not clearly stated as being hydrophobic. In any event, even if the hydrophobic adsorbent used in Eijkhoudt '428 has an affinity for hydrocarbons, such adsorbent can still have greater affinity for metal carbonyls, i.e. it would preferentially remove metal carbonyls before removing hydrocarbons. Furthermore, the removal of hydrocarbon by the adsorbent may not be completed so there would still be some hydrocarbon remained. It should be noted Applicants' claim 13 requires, in step (b), the use of a first catalyst bed is to convert "at least part of the oxygen *and/or* at least one unsaturated hydrocarbon present in the gas

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stream" to one or more catalysis products, so in step (b), the first catalyst bed can be used to remove just oxygen, not hydrocarbon.

Applicants argue that claim 13 requires that at least one hydrocarbon be present in the stream that is leaving the first adsorption step.

Applicants' claim 13 requires that the gas stream to be treated contains unsaturated hydrocarbon, but it does *not* require that the "partially purified gas stream", obtained after contacting the gas stream with the first adsorption step, to contain hydrocarbon as argued by Applicants.

The rejection of claims 16-17 is maintained for the same reasons as stated above.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1793

nmn
March 27, 2010